Mathematics Model Paper(I-B)

Intermediate I - Year

Time: 3 HRS **Max. Marks: 75**

SECTION - I

I.Very Short Answer Questions. Answer all Questions. Each Question carries Two marks.

10 × 2 = 20 M

1. Find the equation of the straight line whose distance from the origin is 4, if the normal ray from the origin to the straight line makes an angle of 135^o with the positive direction of the X-axis.
2. Find the value of k, if the angle between the straight lines $4x - y + 7 = 0$ and $kx - 5y - 9 = 0$ and is 45^o.
3. Find the in centre of the triangle formed by the points (0, 0, 0), (3, 0, 0) and (0, 4, 0).
4. Find the equation to the plane parallel to ZX– plane and passing through (0, 4, 4).
5. Compute $\lim_{x \to 0} \frac{\sin(\pi \cos^2 x)}{x^2}$
6. Compute $\lim_{x \to \infty} \frac{11x^3 - 3x + 4}{13x^3 - 5x^2 - 7}$
7. If $f(x) = 7^{x3 + 3x} (x > 0)$ then find $f'(x)$
8. If $y = ae^{nx} + be^{-nx}$ then prove that $y'' = n^2 y$
9. Find dy and δy of $y = f(x) = x^2 + x$ at $x = 10$ when $\delta x = 0.1$
10. Verify the Roll's theorem for $f(x) = x(x + 3) e^{-x/2}$ in $[-3, 0]$

SECTION - II

II.Short Answer Questions. Ans-wer any 'Five' Questions.Each Question carries 'Four' marks. ***5×4 = 20 M***

11. If A (2, 3) and B(–3, 4) are two points. Find the locus of P so that the area of triangle PAB is 8.5 sq units.
12. When the axis are rotated through an angle $\frac{\pi}{6}$. Find the transformed equation of $x^2 + 2\sqrt{3}xy - y^2 = 2a^2$

13. Find the orthocenter of the triangle whose vertices are (–5, –7), (13, 2) and (–5, 6).

14. Find real constants a, b so that the function f given by f (x) = $\begin{cases} \sin x & \text{if } x \le 0 \\ x^2 + a & \text{if } 0 < x < 1 \\ bx + 3 & \text{if } 1 \le x \le 3 \\ -3 & \text{if } x > 3 \end{cases}$ is continuous on R.

15. Find the derivative of sin2x from the first principle.

16. The volume of a cube is increasing at a rate of 9 cubic centimeters per second. How fast is the surface area increasing when the length of the edge is 10 centimeters?

17. Show that the curves $y^2 = 4(x+1)$ and $y^2 = 36(9-x)$ intersect orthogonally.

SECTION - III

III.Long Answer Questions. Ans-wer any 'Five' Questions. Each Question carries 'Seven' marks. ***5 × 7 = 35 M***

18. If Q (h, k) is the foot of the perpendicular from P (x_1, y_1) on the straight line ax+by+c=0 then show that $(h - x_1) : a = (k - y_1) : b = -(ax_1+by_1+c) : (a^2 + b^2)$

19. Find the lines joining the origin to the points of intersection of the curve $7x^2 - 4xy + 8y^2 + 2x - 4y - 8 = 0$ with the line $3x-y-2=0$ and also the angle between them.

20. Show that the pair of lines $3x^2 + 8xy - 3y^2 = 0$ and $3x^2 + 8xy - 3y^2 + 2x - 4y-1=0$ form a square.

21. Find the angle between the lines whose direction cosines are given by the equations $3l+m+5n = 0$ and $6mn-2nl+5lm = 0$.

22. If $y = \mathrm{Tan}^{-1}\left[\dfrac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right]$ for $0 < |X| < 1$, find $\dfrac{dy}{dx}$

23. If the tangent at any point on the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ intersects the coordinate axes in A and B, then show that the length AB is a constant.

24. If the curved surface of right circular cylinder inscribed in a sph-ere of radius r in maximum. Show that the height of cylinder is $\sqrt{2}r$.